Electric Bomb Fuzing Instrumentation System Test Program on the F/A-18A Aircraft

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Overview

- Introduction
- Test Aircraft and Equipment
- Electric Fuzing Instrumentation System
- Test Method
  - Bench Test
  - Ground Test
  - Flight Test
- Conclusions

Introduction

- U.S. Navy's F/A-18 utilizes an electric bomb fuzing system
- Electrically fuzed weapon systems need to be more reliable
- Electric Fuzing Dud Investigation Systems Engineering Analysis
- Tasked to develop electric fuzing instrumentation system (EFUZIS)

Introduction (cont.)

- Previous systems not viable for flight
- Compact EFUZIS installed in wing pylon
- Transparent to aircraft armament system
- Testing required to demonstrate feasibility

Test Aircraft

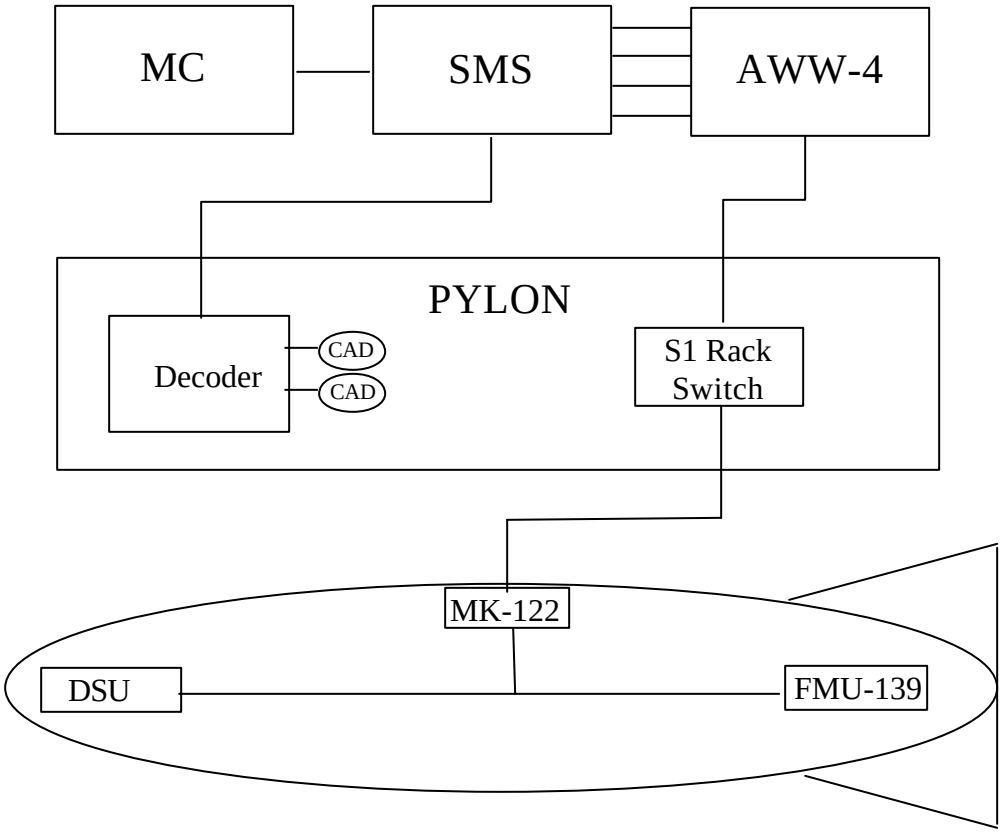
- F/A-18A Hornet, Lot 11
- Single seat, dual engine, supersonic fighter/attack aircraft
- 9 external weapon stations - 5 capable of carrying electrically fuzed weapons

Test configuration not shown.

F/A-18 Fuzing System

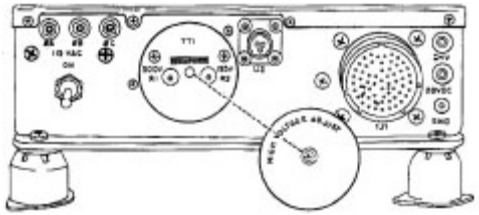
- Mission Computer
- Armament Computer
- AN/AWW-4 Fuze Function Control Set
- BRU-32 Bomb Rack (S1 Switch)
- Mk-122 Safety Switch
- FMU-139 Electronic Fuze

F/A-18 Fuzing System



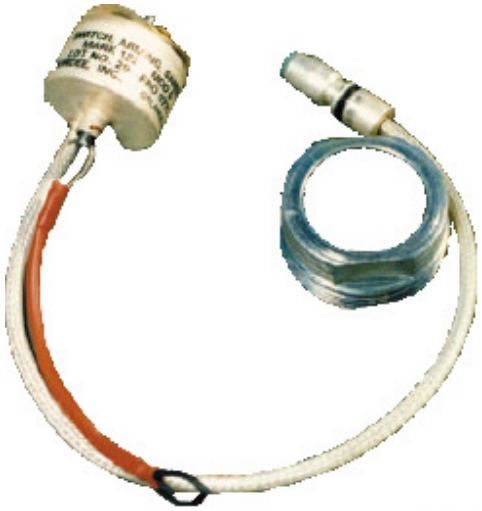
AN/AWW-4

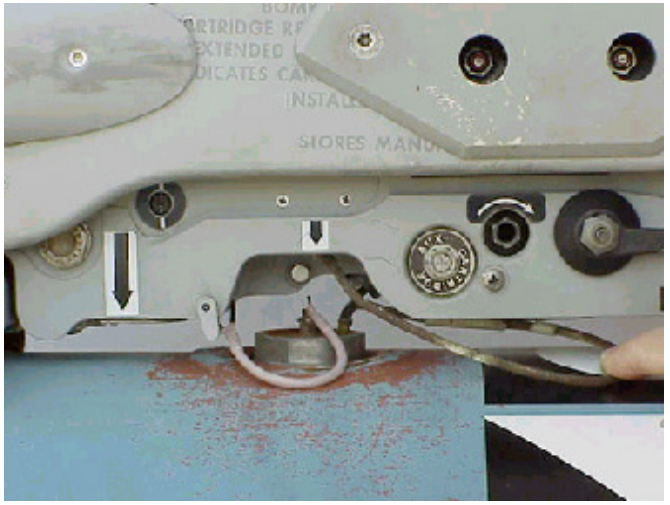
- Power supply for the fuzing system

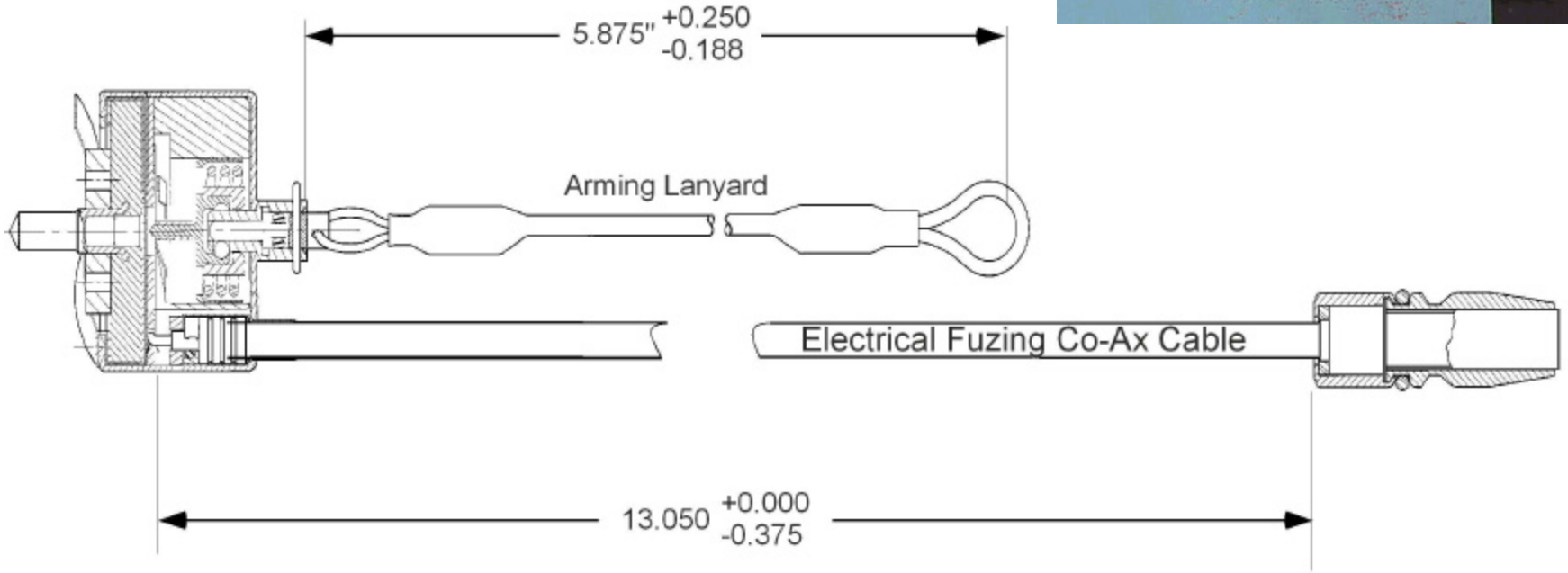


- Controlled by the armament computer
- Outputs voltages according to fuzing options
  - ±195V
  - ± 300V

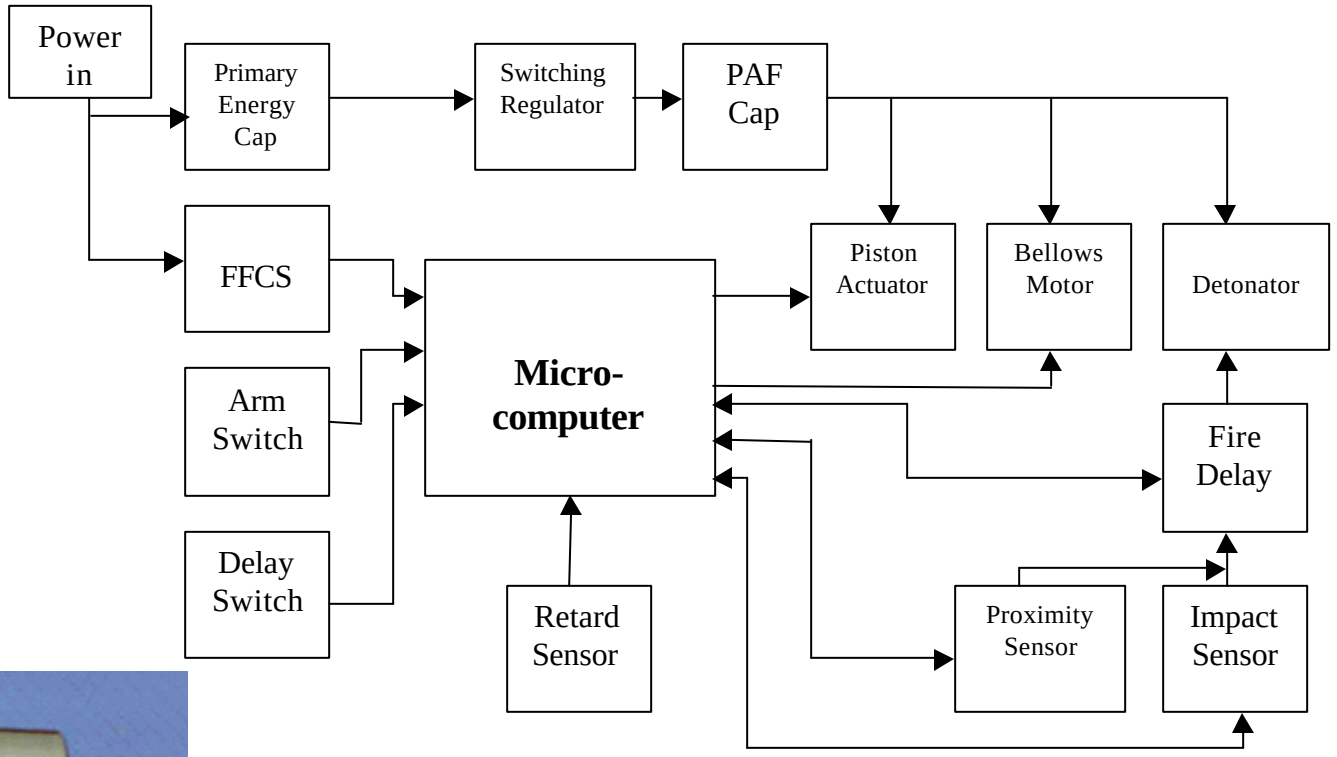
MK-122 Switch





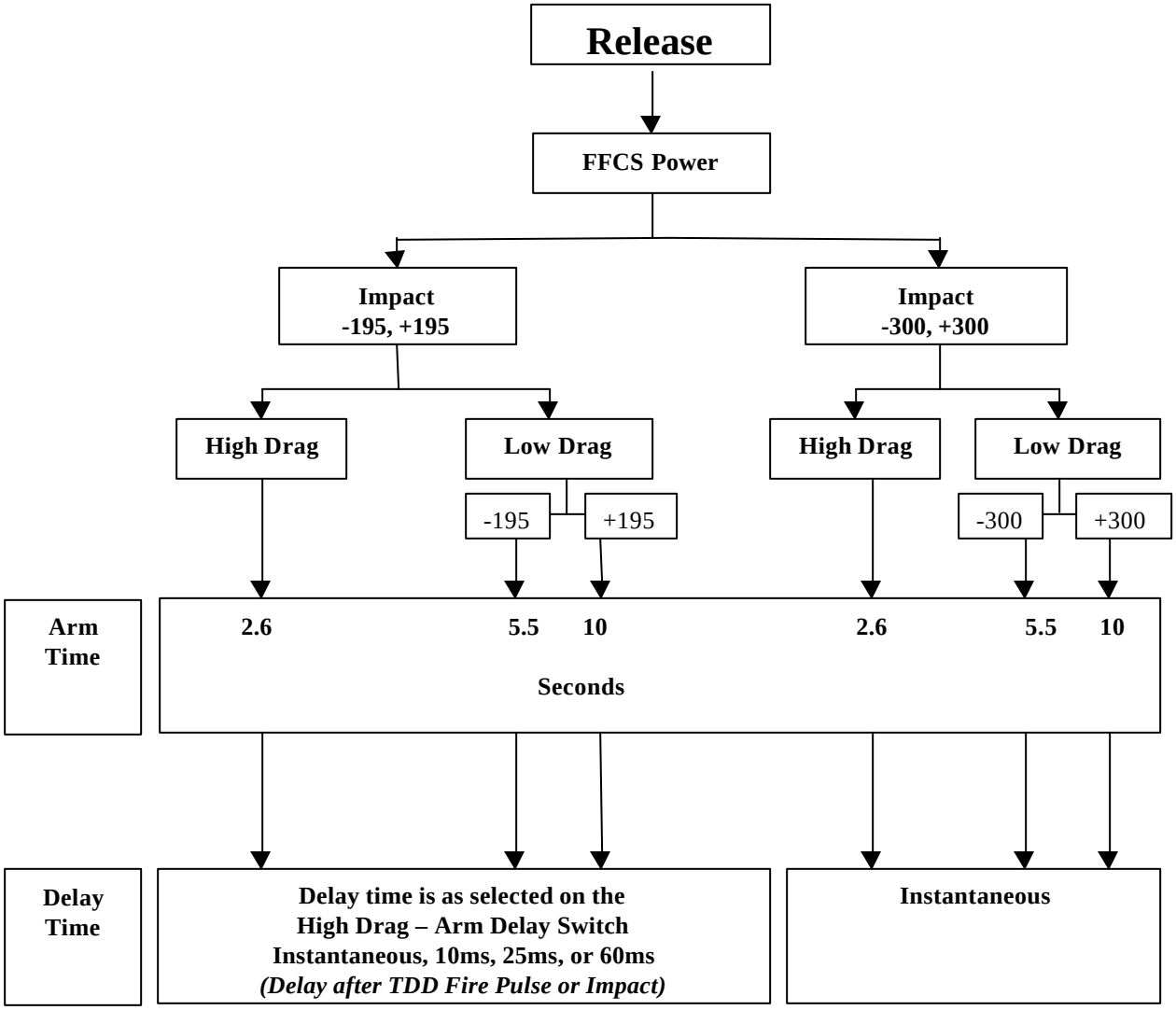


FMU-139 Fuze


Power in
Primary Energy Cap
Switching Regulator
PAF Cap
FFCS
Piston Actuator
Bellows Motor
Detonator
Micro-computer
Arm Switch
Fire Delay
Delay Switch
Retard Sensor
Proximity Sensor
Impact Sensor


INERT
WARNING
NAVY USAGE
AIR FORCE USAGE

Fuze Operation



EFUZIS

- EDR-3 is a six-channel, solid state, digital recorder
- Analog or digital inputs within a range of ±2 volts
- Sampling rates up to 3200 Hz per channel

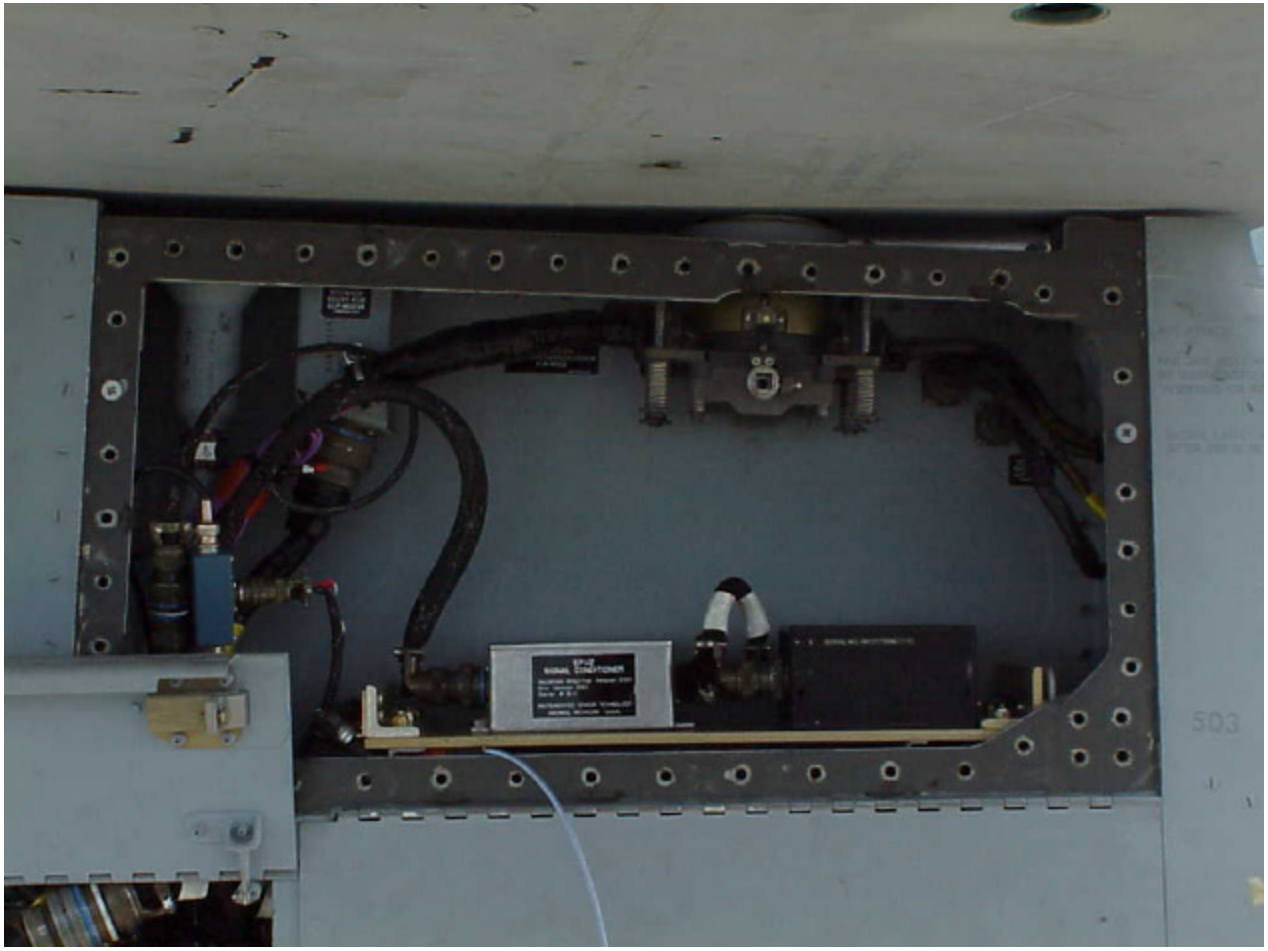
- Maximum event length of 9,999 samples, at a maximum of 5,000 events
- Primary power source is a/c power, lithium battery back-up
- Measures 4.4 x 4.2 x 2.2 inches and weighs 2.2 lbs

EFUZIS Parameters

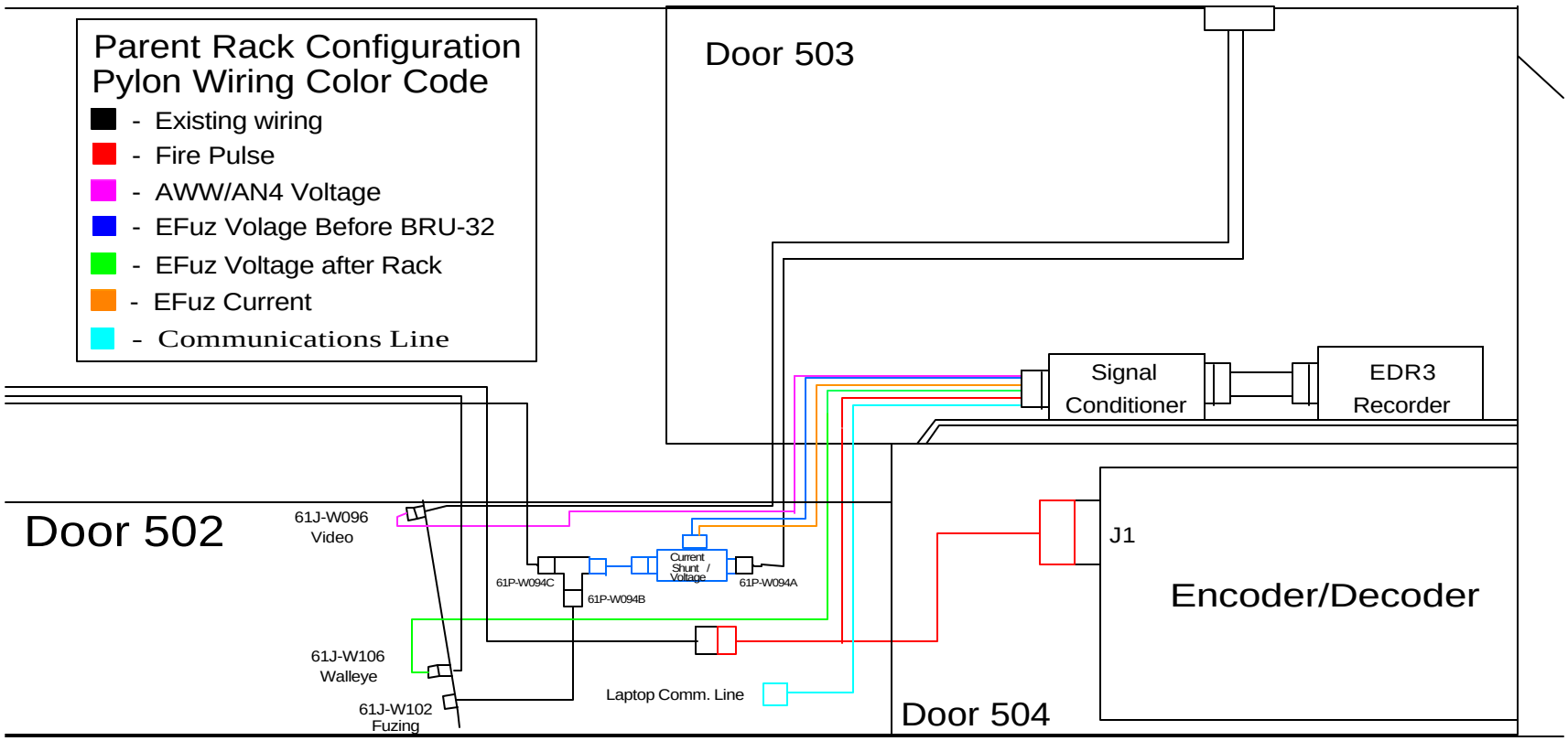
- AWW- 4 Power Supply Output (±195, ±300V)
- BRU- 32 Bomb Rack Fuzing Input (±195, ±300V)
- BRU- 32 Bomb Rack Fuzing Output (±195, ±300V)
- Fuze Current (~80mA)
- Fire Pulse (28V)

Pylon Installation

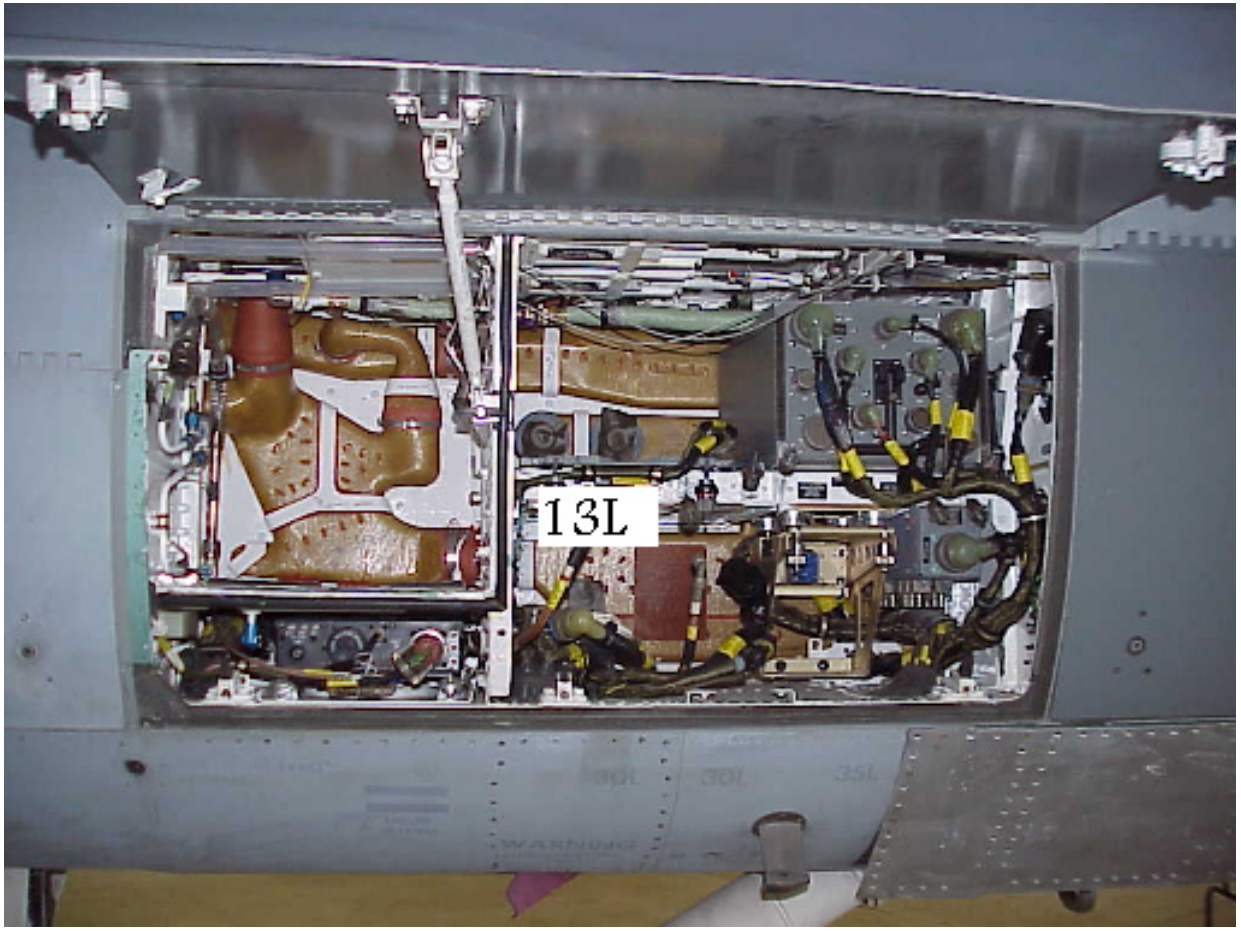
Pylon Installation



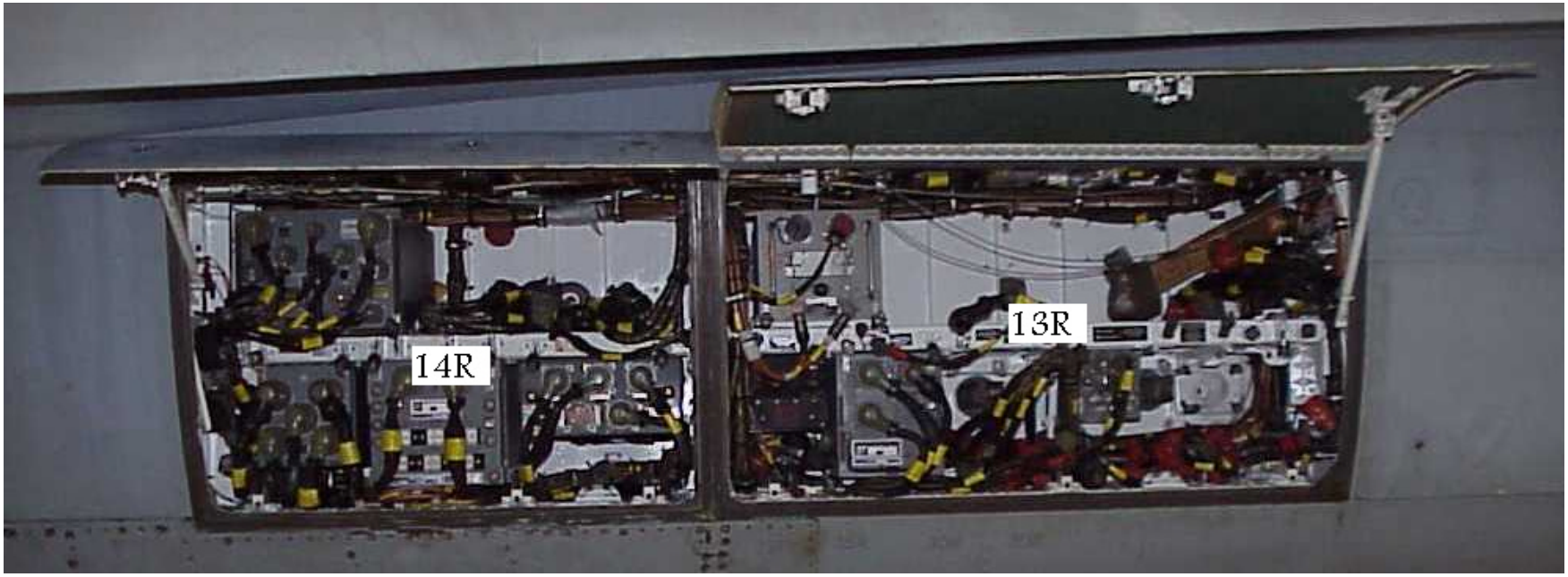
EFUZIS Diagram



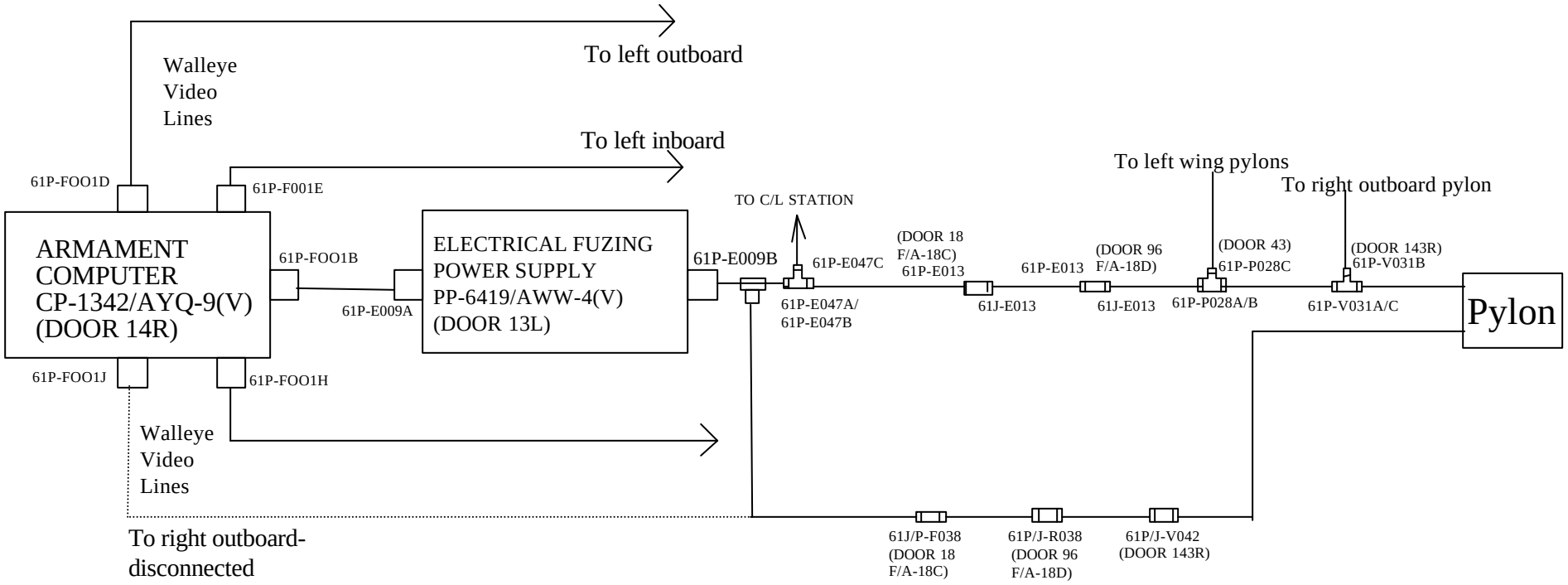
Fuselage Installation



Fuselage Installation



Fuselage Wiring



Basic Operation

- Program recorder during preflight (recorder on battery power)
- Recorder powers up with a/c
- Goes into idle state, waits for trigger
- Triggers on fire pulse
- Download to laptop
- Export data to Excel

Basic Operation (cont.)

- Parent/CVER configurations
- Multiple releases

- Laptop Specifications
  - Windows OS
  - Serial port
  - IST software

Bench Tests

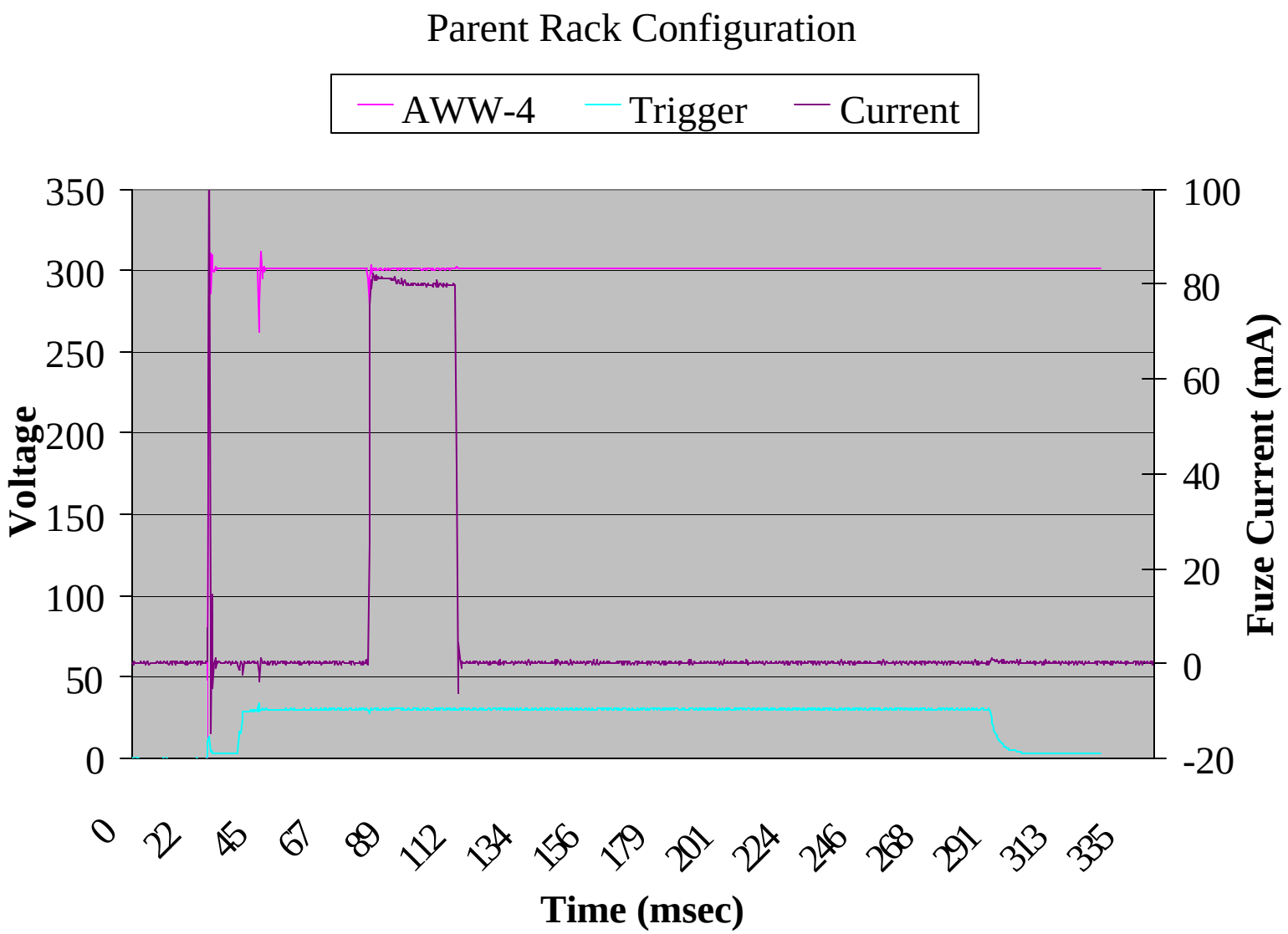
- Limited demonstration
- Test setup:
  - AWW- 4 fuzing power supply
  - BRU- 32 bomb rack simulation circuit
  - FMU- 139 fuze simulator
  - Interface unit for selecting fuzing voltage polarities and amplitudes
  - IST recorder and signal conditioner
  - Laptop computer with Windows operating system

Ground Tests

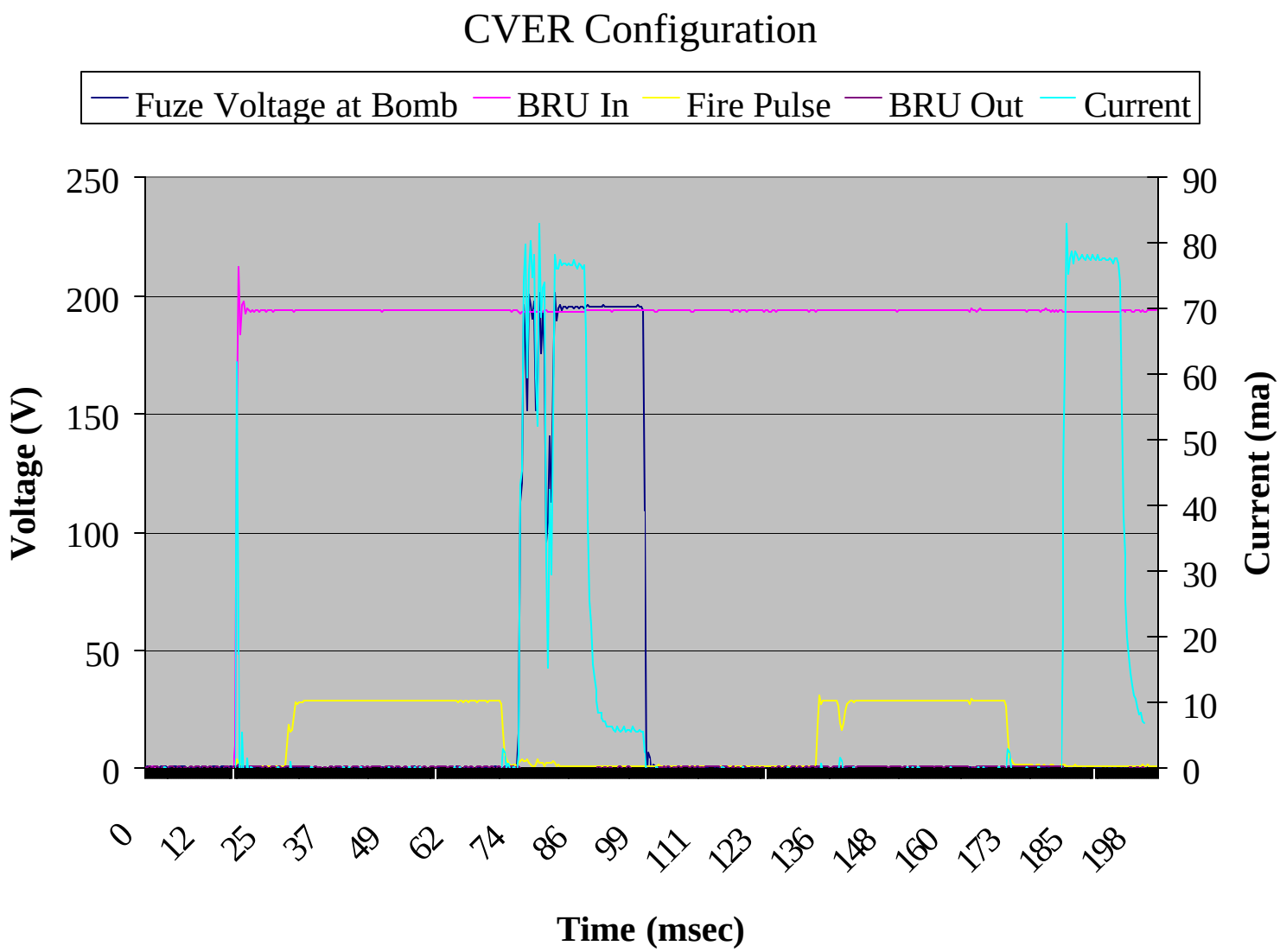
- Performed on F-18 Test Bed
- 73 ejections of MK-82 bomb bodies
- Parent rack and CVER configurations
- FMU-139 simulators used
- Recorder reset before each release
- Data downloaded after each release

Ground Test Setup

Ground Test Data



Ground Test Data



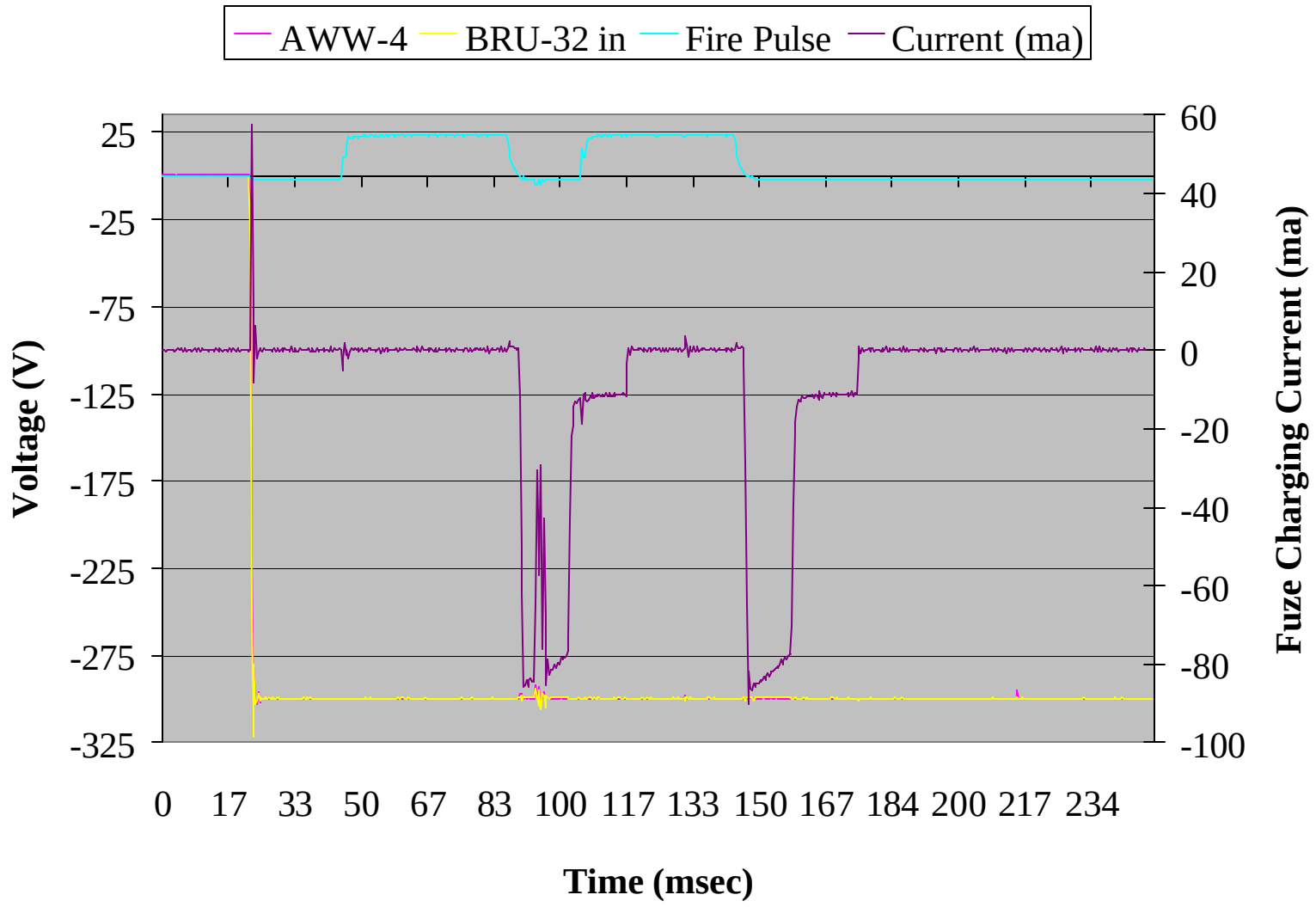
Flight Test

- One flight of 1.2 hours was flown in the local NAWC-AD, Patuxent River, areas
- Aircraft was loaded with two MK-82s on a CVER on station two
- Stores Management System
  - Manual mode release
  - 60 ms release interval
  - Quantity two
  - Multiple one

Flight Test

- Fuzing options
  - Instantaneous functioning time
  - Ten second arming time
- Weapon Release: 1G level flight at 5000 Ft AGL
- Maneuvers conducted to evaluate airworthiness
  - Steady heading sideslip
  - 45° negative dive
  - Negative 1G pushover
  - Negative 2G pushover
  - 360 Roll
  - Wind up turn (4.5G, 6.5G)
  - Wind down turn (4.5G)
  - Field touch and go's

Flight Test Data



Conclusions

- The EFUZIS demonstrated excellent potential for gathering electrical fuzing data

- The test team proved with extensive ground and flight testing that the EFUZIS functioned properly and could withstand the harsh environment of aircraft flight.

Questions?

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